

**CENTRAL AND SOUTHERN FLORIDA PROJECT
COMPREHENSIVE REVIEW STUDY**

**FINAL
INTEGRATED FEASIBILITY REPORT
AND
PROGRAMMATIC ENVIRONMENTAL IMPACT
STATEMENT**

U.S. ARMY CORPS OF ENGINEERS
JACKSONVILLE DISTRICT

SOUTH FLORIDA WATER
MANAGEMENT DISTRICT

APRIL 1999

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Responsible Agencies: The responsible lead agency is the U.S. Army Corps of Engineers, Jacksonville District. The responsible cooperating agencies are the South Florida Water Management District, the U.S. Fish and Wildlife Service, the U.S. Environmental Protection Agency, the National Park Service, the Florida Game and Fresh Water Fish Commission, the U.S. Geological Survey, the Natural Resources Conservation Service, and the Florida Department of Environmental Protection.

Abstract: The south Florida ecosystem is a nationally and internationally unique and important natural resource. It is also a resource in peril, having been severely impacted by human activities for over a hundred years. This report recommends a comprehensive plan for the restoration, protection, and preservation of the water resources of central and southern Florida, including the Everglades. This is a final integrated feasibility report and Programmatic Environmental Impact Statement, which identifies and discusses the plan's proposed project features, its beneficial effects and potential impacts on existing resources. The recommended Comprehensive Plan contains over sixty project features. Principal features of the plan are the creation of approximately 217,000 acres of new reservoirs and wetlands based water treatment areas. These features vastly increase storage and water supply for the natural system, as well as for urban and agricultural needs, while maintaining current Central and Southern Florida Project purposes. The recommended Comprehensive Plan achieves the restoration of more natural flows of water, including sheetflow, improved water quality, and more natural hydroperiods in the south Florida ecosystem. Improvements to native flora and fauna, including threatened and endangered species, will occur as a result of the restoration of hydrologic conditions.

THE OFFICIAL CLOSING DATE
FOR THE RECEIPT OF COMMENTS
IS 30 DAYS FROM THE DATE ON
WHICH THE NOTICE OF AVAILABILITY
OF THIS FINAL PROGRAMATIC EIS
APPEARS IN THE FEDERAL REGISTER.

If you require further
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document, contact:

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NOTE: This report includes an integrated Programmatic Environmental Impact Statement (PEIS) within the final feasibility report; sections required for compliance with the National Environmental Policy Act (NEPA) are noted by an asterisk in the Table of Contents.

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SUMMARY

The recommended Comprehensive Plan contained within this report will, when implemented, restore, protect, and preserve a natural resource treasure – the south Florida ecosystem. The greater Everglades ecosystem is nationally significant and unique in the world. If actions are not taken now, irretrievable loss of this extraordinary resource will occur. The Comprehensive Plan affords the opportunity to reverse the course of declining ecosystem health and leave an Everglades legacy for generations to come.

The Central and Southern Florida (C&SF) Project, first authorized by Congress in 1948, is a multi-purpose project that provides flood control, water supply for municipal, industrial, and agricultural uses, prevention of saltwater intrusion, water supply for Everglades National Park, and protection of fish and wildlife resources. The primary system includes about 1,000 miles each of levees and canals, 150 water control structures, and 16 major pump stations.

The C&SF Project Comprehensive Review Study, known as the Restudy, is authorized by Section 309(l) of the Water Resources Development Act of 1992 (P.L.102-580). This study is also authorized by two resolutions of the Committee on Transportation and Infrastructure, United States House of Representatives, dated September 24, 1992. Section 528 of the Water Resources Development Act of 1996 provides specific direction and guidance for the Restudy.

The purpose of this study was to reexamine the C&SF Project to determine the feasibility of modifying the project to restore the south Florida ecosystem and to provide for the other water-related needs of the region. Specifically, as required by the authorizing legislation, the study investigated making structural or operational modifications to the C&SF Project for improving the quality of the environment; protecting water quality in the south Florida ecosystem; improving protection of the aquifer; improving the integrity, capability, and conservation of urban and agricultural water supplies; and improving other water-related purposes.

The following principles guided the development of the recommended Comprehensive Plan:

- The overarching objective of the Comprehensive Plan is the restoration, preservation and protection of the south Florida ecosystem while providing for other water related needs of the region;
- The Comprehensive Plan will be based on the best available science, and independent scientific review will be an integral part of its development and implementation;
- The Comprehensive Plan will be developed through an inclusive and open process that engages all stakeholders;
- All applicable Federal, tribal, state, and local agencies will be full partners and their views will be considered fully; and
- The Comprehensive Plan must be a flexible plan that is based on the concept of adaptive assessment – recognizing that modifications will be made in the future based on new information.

Although this document meets the requirements of Section 404 (r) of the Clean Water Act (Public Law 92-500, as amended), as addressed in Annex C, the Corps will request a Section 401 State water quality certificate during subsequent phases of this project.

The final integrated feasibility report and Programmatic Environmental Impact Statement is being transmitted through the Division Engineer and the Washington-level Federal report review process, which will include reviews by the Chief of Engineers and the Secretary of the Army. The Assistant Secretary of the Army for Civil Works, representing the Secretary of the Army, will coordinate the documents with the Office of Management and Budget, and send them to Congress. The study authority states that the Secretary shall transmit the Comprehensive Plan to Congress not later than July 1, 1999.

MAJOR CONCLUSIONS

The Everglades has molded the regional character of central and southern Florida and sustains the economic and cultural growth of the region. The Everglades has influenced the regional mosaics of space and landscape patterns - urban, agricultural and natural. As such, it epitomizes the region's sense of definition and place. As importantly, the Everglades is unlike any other place in the world.

The remaining Everglades and other natural ecosystems in south Florida no longer exhibit the functions, richness, and spatial extent that defined the pre-drainage systems. There have been substantial and irreversible reductions in the

spatial extent of the wetland systems (including an approximately 50 percent reduction in the extent of the true Everglades) and in the total water storage, timing, and flow capacities of these systems. These natural systems will not recover their defining characteristics under current conditions and will not be sustained into the future. Indeed, the health of the ecosystem will continue to decline unless corrective actions are taken. For example, wading birds, whose numbers have already decreased by 85-90 percent, are key indicators of broad, regional patterns of aquatic production. There is a continuing reduction in the total number of birds initiating breeding in south Florida. Fisheries, including economically important recreational and commercial species, continue to decline steadily in many areas of south Florida, affecting the natural and the human environment.

Several of the major unintended impacts to the natural system attributed to the C&SF Project in south Florida include the following:

- extreme fluctuations in high and low water levels in Lake Okeechobee have a major adverse impact on the lake's littoral and pelagic zones and fish and wildlife habitats;
- extreme fluctuations between too much and too little freshwater discharge into the Caloosahatchee and St. Lucie estuaries result in detrimental salinity conditions and physical alterations of fish and wildlife habitat;
- detrimental hydrologic conditions in freshwater wetland habitats cause major adverse impacts on plant and animal communities of the native Everglades; and
- unsuitable freshwater flows to Florida and Biscayne bays and Lake Worth Lagoon adversely impact salinity and physically alter fish and wildlife habitat.

Water quality throughout south Florida has also deteriorated over the past 50 years since construction started on the C&SF Project. Many wetlands that acted as natural filters and retention areas either can no longer serve these purposes or have been lost to drainage or development. Urban and agricultural development and drainage systems result in the rapid discharge of runoff containing pollutants into south Florida's water bodies. As a result, many water bodies throughout south Florida presently do not meet water quality standards. Untreated urban and agricultural storm water that does not meet water quality standards is sometimes sent to natural areas. Excessive nutrients entering the Everglades have led to an overabundance of cattails, a visible sign of unfavorable water quality conditions and a potential decline in ecological productivity. Flood control releases from Lake Okeechobee and runoff discharged via secondary drainage canals in the St. Lucie River Basin have been linked to fish lesions and a decline in estuarine productivity, resulting in substantial ecological and economic impacts.

Adequately and reliably meeting water supply for all sectors is also a problem. Historically, most rainwater soaked into the ground in the region's vast wetlands. As south Florida developed, the canal network worked too effectively and drained too much water off the land too quickly. The result is that not enough water is stored for all uses. Water shortages that occur today are expected to become more frequent without any changes to the water management system. Without the steps outlined in this Comprehensive Plan, conflicts over the allocation of water needed for natural, agricultural, and urban areas will only increase.

Flooding is also a problem. Florida is a low-lying, flat, and wet state. Today, the Project provides flood protection on a regional basis for south Florida, supported by many locally operated canal networks. The Comprehensive Plan will maintain, and in some situations improve, this important protection from flooding.

Altogether, these problems seriously threaten the natural and human environment of the south Florida ecosystem.

What Is Expected to Happen Without the Recommended Comprehensive Plan

Although some level of ecological improvement will occur in the south Florida ecosystem as a result of implementation of projects currently planned outside of the Restudy, the cumulative, regional benefits from these projects would not result in a sustainable south Florida ecosystem. Specifically, based on an evaluation of conditions in the year 2050 without the recommended Comprehensive Plan, it was determined that the overall health of the ecosystem will have substantially deteriorated. This type of assessment was carried out for all planning alternatives evaluated during the course of the Restudy. The analyses show that making modifications to only some portions of the C&SF Project in order to achieve sustainable natural systems will not succeed. Conditions predicted in 2050 fail to meet the basic needs of the south Florida ecosystem.

Demands placed on Lake Okeechobee result in damaging water levels and extreme harm to the littoral zone. Damaging fresh water discharges into the Caloosahatchee and St. Lucie estuaries result in major harm to fisheries. Damaging high flows alter salinity balances in Lake Worth Lagoon. Hydropatterns predicted for the Water Conservation Areas are harmful to tree islands. Everglades National Park does not receive enough freshwater flow to maintain important aquatic habitat in Shark River Slough. Low flows to Florida and Biscayne bays also result in harm to the resources in these areas. These ecological problems would not be corrected solely by implementation of currently planned or ongoing projects.

Relatively greater levels of improvement were identified for water quality conditions in the future compared to existing conditions in south Florida. It is expected that state, tribal, regional, and local programs to improve water quality

will be implemented to varying degrees throughout the study area during the next 50 years. Ongoing restoration projects in the Kissimmee River watershed are expected to beneficially affect water quality. Current efforts to reduce inputs of excessive nutrients into the Everglades through the Everglades Construction Project should substantially slow the spread of cattails and other plants with high nutrient tolerances and result in a slow recovery of natural vegetation patterns in some nutrient-stressed parts of the system. Proposed modifications to the Lake Okeechobee regulation schedule and water quality improvement projects suggested by the South Florida Ecosystem Restoration Working Group's Lake Okeechobee, St. Lucie, and Caloosahatchee Issue Teams should improve water quality conditions in those water bodies. Nonetheless, the future without plan condition, while resulting in water quality improvements over existing conditions in certain subregions of the Restudy area, was still determined by the Restudy's water quality team to be unacceptable for sustainable ecosystems.

The future demand for suitable water is expected to exceed the limits of readily available sources. Predictions of water restrictions in the future indicate serious – and probably unacceptable – levels of water supply cutbacks. Modeling of the future “without plan” condition shows that for the Lake Okeechobee Service Area, 24 percent of water supply demands could not be met over a 30-year period. This translates into water supply restrictions every other year. In the Lower East Coast, water restrictions would be expected to occur every other year in Palm Beach, Miami-Dade, and the Florida Keys portion of Monroe County. In Broward County water restrictions would occur on nearly an annual basis. The ability to sustain the region's natural resources, economy, and quality of life depends, to a great extent, on the success of the efforts to enhance, protect, and better manage the region's water resources.

A major advantage of the Comprehensive Review Study is that it has used tools and methods to evaluate the entire C&SF Project area together as an integrated system. Thus, the effects of making modifications in one area on another area were able to be seen and then used to develop a plan that maximized positive system-wide benefits. The South Florida Water Management Model is the tool that demonstrates the hydrologic effects of changes in one region on other regions. The Restudy Team developed measures to evaluate an alternative plan's effect on the entire C&SF Project area. The use of system-wide tools and a science-based analytical approach supports the conclusion, as shown in the following table, that the future without plan condition is not favorable - nor is it sustainable - for the south Florida ecosystem.

**PERFORMANCE OF THE COMPREHENSIVE PLAN
COMPARED TO THE NO-ACTION ALTERNATIVE**

Area	Future Without Plan	Future With Plan	
Lake Okeechobee	Y	G	
Caloosahatchee Estuary	R	G	
St Lucie Estuary	R	G	
Lake Worth Lagoon	Y	Y	
Holey Land & Rotenberger WMA	Y	G	
Loxahatchee National Wildlife Refuge	Y	G	
Water Conservation Area 2A		G/Y	
Water Conservation Area 2B		R	
Northwestern Water Conservation Area 3A		G	
Northeastern Water Conservation Area 3A		Y	
Eastern Water Conservation Area 3A		Y	
Central & Southern Water Conservation Area 3A		G/Y	
Water Conservation Area 3B		Y	
Everglades National Park – Shark River Slough		R	G
Everglades National Park – Rockland Marl Marsh		R	Y
Florida Bay		R	G
Biscayne Bay	Y	G	
Model Lands	R	G	
Big Cypress National Preserve	Y	G	
Lake Okeechobee Service Area	R	G	
Urban Lower East Coast	R	G	

Green (G) - predicted hydrologic performance will result in recovery and long-term sustainability of ecological or water supply objectives.

Yellow (Y) -marginal or uncertain ability to achieve long-term sustainability of ecological or water supply objectives.

Red (R) -ecological or water supply objectives will not be met.

How the Restudy Team Developed the Recommended Comprehensive Plan

A multi-agency, multidisciplinary team was created to develop plans that addressed the problems within the study area. This team included biologists, ecologists, economists, engineers, geographic information system specialists, hydrologists, planners, public involvement specialists, and real estate specialists from a number of Federal, state, tribal, and local government agencies.

Between September 1997 and June 1998, alternative comprehensive plans were formulated and evaluated. Beginning with a “Starting Point” alternative and continuing until the recommended plan was chosen, each iterative formulation and evaluation cycle built upon the strengths of the previous alternative plan while addressing its shortfalls. The Alternative Evaluation Team, a subgroup of the Restudy Team, evaluated each alternative based on modeling results and comments received from the entire team as well as the general public. The Alternative Development Team, another Restudy subgroup, then used that evaluation to design a better alternative. All modeling results and evaluations were posted on the Restudy web site for the team and general public to review.

Because of its fundamental importance to restoration, much of the emphasis early in the plan formulation process was on increasing regional storage capacity and increasing water management flexibility to meet water quantity objectives. Later iterations addressed the restoration objectives of greater system connectivity (decompartmentalization) and sheetflow. Throughout the formulation and evaluation period, many different decompartmentalization scenarios were modeled. These scenarios gave the team feedback on how the system responded under different conditions. This knowledge was valuable in the effort to improve conditions in the remaining Everglades in the final alternative, which became the basis of the recommended Comprehensive Plan.

The Restudy Team recognized that water quality standards were not being met in many water bodies in the study area. The team recognized the changes in flow patterns, even though beneficial hydrologically, might adversely affect water quality conditions in downstream water bodies. To address this problem, several water quality treatment facilities were included in the recommended Comprehensive Plan to ensure water quality standards would be met. Future implementation of the features of the Comprehensive Plan, including detailed planning and design, will take into account water quality restoration targets as they are developed for specific water bodies in south Florida.

Major Features of the Recommended Comprehensive Plan

The Restudy Team formulated and evaluated 10 alternative comprehensive plans and more than 25 intermediate computer simulations. Alternative D-13R was selected as the Initial Draft Plan. Alternative D-13R along with the series of Other Project Elements, Critical Projects, water quality treatment facilities, and other modifications that further improve performance of the plan, comprise the recommended Comprehensive Plan. The estimated first cost of the recommended Comprehensive Plan is \$7.8 billion; and the annual operation and maintenance costs, including adaptive assessment and monitoring, are \$182 million. The plan includes the following structural and operational changes to the existing C&SF Project:

Surface Water Storage Reservoirs. A number of water storage facilities are planned north of Lake Okeechobee, in the Caloosahatchee and St. Lucie basins, in the Everglades Agricultural Area, and in the Water Preserve Areas of Palm Beach, Broward and Miami-Dade counties. These areas will encompass approximately 181,300 acres and will have the capacity to store 1.5 million acre-feet of water.

Water Preserve Areas. Multipurpose water management areas are planned in Palm Beach, Broward and Miami-Dade counties between the urban areas and the eastern Everglades. The Water Preserve Areas will have the ability to treat urban runoff, store water, reduce seepage, and improve existing wetland areas.

Manage Lake Okeechobee as an Ecological Resource. Lake Okeechobee is currently managed for many, often conflicting, uses. The lake's regulation schedule will be modified and plan features constructed to reduce the extreme high and low levels that damage the lake and its shoreline. Management of intermediate water levels will be improved, while allowing the lake to continue to serve as an important source for water supply. Several plan components and Other Project Elements are included to improve water quality conditions in the lake. A study is recommended to evaluate in detail the dredging of nutrient-enriched lake sediments to help achieve water quality restoration targets, important not only for the lake, but also for downstream receiving bodies.

Improve Water Deliveries to Estuaries. Excess stormwater that is discharged to the ocean and the gulf through the Caloosahatchee and St. Lucie rivers is very damaging to their respective estuaries. The recommended Comprehensive Plan will greatly reduce these discharges by storing excess runoff in surface and underground water storage areas. During times of low rainfall, the stored water can be used to augment flow to the estuaries. Damaging high flows will also be reduced to the Lake Worth Lagoon.

Underground Water Storage. Wells and associated infrastructure will be built to store water in the upper Floridan aquifer. As much as 1.6 billion gallons a day may be pumped down the wells into underground storage zones. The injected fresh water, which does not mix with the saline aquifer water, is stored in a "bubble" and can be pumped out during dry periods. This approach, known as aquifer storage and recovery, has been used for years on a smaller scale to augment municipal water supplies. Since water does not evaporate when stored underground and less land is required for storage, aquifer storage and recovery has some advantages over surface storage. The recommended Comprehensive Plan includes aquifer storage and recovery wells around Lake Okeechobee, in the Water Preserve Areas, and the Caloosahatchee Basin.

Treatment Wetlands. Approximately 35,600 acres of manmade wetlands, known as stormwater treatment areas, will be built to treat urban and agricultural runoff water before it is discharged to the natural areas throughout the system. Stormwater treatment areas are included in the recommended Comprehensive Plan for basins draining to Lake Okeechobee, the Caloosahatchee River Basin, the St. Lucie Estuary Basin, the Everglades, and the Lower East Coast. These are in addition to the over 44,000 acres of stormwater treatment areas already being constructed pursuant to the Everglades Forever Act to treat water discharged from the Everglades Agricultural Area.

Improve Water Deliveries to the Everglades. The volume, timing, and quality of water delivered to the south Florida ecosystem will be greatly improved. The Comprehensive Plan will deliver an average of 26 percent more water into

Northeast Shark River Slough over current conditions. This translates into nearly a half million acre-feet of additional water reaching the slough, and is especially critical in the dry season. More natural refinements will be made to the rainfall-driven operational plan to enhance the timing of water sent to the Water Conservation Areas, Everglades National Park, and the Holey Land and Rotenberger Wildlife Management Areas.

Remove Barriers to Sheetflow. More than 240 miles of project canals and internal levees within the Everglades will be removed to reestablish the natural sheetflow of water through the Everglades. Most of the Miami Canal in Water Conservation Area 3 will be removed and 20 miles of the Tamiami Trail (U.S. Route 41) will be rebuilt with bridges and culverts, allowing water to flow more naturally into Everglades National Park, as it once did. In the Big Cypress National Preserve, a north-south levee will be removed to restore more natural overland water flow.

Store Water in Existing Quarries. Two limestone quarries in northern Miami-Dade County will be converted to water storage reservoirs to supply Florida Bay, the Everglades, Biscayne Bay, and Miami-Dade County residents with water. The 11,000-acre area will be ringed with an seepage barriers to ensure that stored water does not leak or adjacent groundwater does not seep into the area. A similar facility will be constructed in northern Palm Beach County.

Reuse Wastewater. The recommended Comprehensive Plan includes two advanced wastewater treatment plants in Miami-Dade County capable of making more than 220 million gallons a day of the county's treated wastewater clean enough to discharge into wetlands along Biscayne Bay and for recharging the Biscayne Aquifer. This reuse of water will improve water supplies to south Miami-Dade County as well as reducing seepage from the Northeast Shark River Slough area of the Everglades. Given the high cost associated with using reuse to meet the ecological goals and objectives for Biscayne Bay, other potential sources of water to provide freshwater flows to the central and southern bay will be investigated before pursuing reuse.

Pilot Projects. A number of technologies proposed in the Comprehensive Plan have uncertainties associated with them -- either in the technology itself, its application, or in the scale of implementation. While none of the proposed technologies are untested, what is not known is whether actual performance will measure up to that anticipated in the Comprehensive Plan. The pilot projects, which include wastewater reuse, seepage management, Lake Belt technology, and three aquifer storage and recovery projects are recommended to address uncertainties prior to full implementation of these components.

Improve Fresh Water Flows to Florida Bay. Improved water deliveries to Shark River Slough, Taylor Slough, and wetlands to the east of Everglades National Park

will in turn provide improved deliveries of fresh water flows to Florida Bay. A feasibility study is also recommended to evaluate additional environmental restoration needs in Florida Bay and the Florida Keys.

Southwest Florida. There are additional water resources problems and opportunities in southwest Florida requiring studies beyond the scope of the Restudy recommended Comprehensive Plan. In this regard, a feasibility study for Southwest Florida is being recommended to investigate the region's hydrologic and ecological restoration needs.

Comprehensive Integrated Water Quality Plan. The recommended Comprehensive Plan includes a follow-on feasibility study to develop a comprehensive water quality plan to ensure that the Comprehensive Plan leads to ecosystem restoration throughout south Florida. The water quality feasibility study would include evaluating water quality standards and criteria from an ecosystem restoration perspective and recommendations for integrating existing and future water quality restoration targets for south Florida water bodies into future planning, design, and construction activities to facilitate implementation of the recommended Comprehensive Plan. Further, water quality in the Keys is critical to ecosystem restoration. The Florida Keys Water Quality Protection Plan includes measures for improving wastewater and stormwater treatment within the Keys. Implementation of the Keys Water Quality Protection Plan is critical for restoration of the south Florida ecosystem.

Overall, the recommended Comprehensive Plan will capture and store much of the water that is now lost to the ocean and gulf. This will provide enough water in the future for both the ecosystem, as well as urban and agricultural users. It will continue to provide the same level of flood protection as it does at present, if not more, for south Florida. The Comprehensive Plan is a system-wide solution for ecosystem restoration, water supply, and flood damage reduction. It is a necessary step towards a sustainable south Florida.

What the Comprehensive Plan Will Accomplish

Implementation of the recommended Comprehensive Plan will result in the recovery of healthy, sustainable ecosystems throughout south Florida. It is a plan that will lead to a much improved environment, for people and for the plants and animals that depend upon the natural system for their survival. The Comprehensive Plan contains all of the essential components to achieve this goal. There are many reasons for having confidence that it will be successful. No other plan, especially one on a smaller scale or one lacking the appropriate balance between ecosystem restoration and future urban and agricultural water supply objectives, would achieve a similar level of success.

The Comprehensive Plan does not provide all the answers – no plan could. The plan, however, contains an aggressive adaptive assessment strategy that includes independent scientific peer review and a process for identifying and resolving uncertainties. Because it is acknowledged that all the answers cannot be known at this time, and that inaction is not an option, adaptive assessment provides the means to allow restoration to move forward. A major strength of the current plan is that its flexibility allows for efficient and successive opportunities to make further improvements as we refine our plans and obtain new information.

The focus of the recommended Comprehensive Plan has been on recovering the defining ecological features of the original Everglades and other south Florida ecosystems. What made these ecosystems unique was their topographic flatness and expansiveness, and that they formed hydrologically integrated systems from boundary to boundary. What this means in a healthy ecosystem is that water patterns in one part of the system could be used to predict the patterns throughout the system. Animals living in the Everglades would “read” the water patterns, and “know” where to go to find the food and water that they needed for successful reproduction and survival under a range of natural conditions. It was the combination of connectivity and space that created the range of habitats needed for the diversity of plants and animals. The construction of the many levees and dikes designed to compartmentalize the Everglades and separate Lake Okeechobee from its natural overflow, and the canals that drained water to the coast, disrupted these natural patterns, and destroyed the ability of many animals to find the dependable habitat needed for their survival at the right time.

The recommended Comprehensive Plan, by removing over 240 miles of internal levees in the Everglades, and approaching recovery of the natural volume of water in the remaining wetlands, will restore these essential defining features of the pre-drainage wetlands over large portions of the remaining system. The plan also includes water storage and water quality treatment areas that will improve water quality conditions in the south Florida ecosystem. In response to this substantial improvement, the characteristic animals of these ecosystems will show dramatic and positive responses. At all levels in the aquatic food chains, the numbers of such animals as crayfish, minnows, sunfish, frogs, alligators, herons, ibis, and otters, will markedly increase. Equally important, animals will respond to the recovery of more natural water patterns by returning to their traditional distribution patterns.

The recommended Comprehensive Plan will support the return of the large nesting “rookeries” of wading birds to Everglades National Park, and the recovery of several endangered species to more certain and optimistic futures. Wading birds, e.g., herons, egrets, ibis and storks, are symbolic of the overall health of the Everglades. As recently as the 1950s and 1960s, large “super colonies” of nesting waders remained in the park; none have been there since. Wading birds, perhaps

more than any other animal, assess the quality of habitats over the entire basin of south Florida wetlands, before making “decisions” about where and when, or even whether, to nest. The recovery of the super colonies will be a sure sign that the entire ecosystem has made substantial progress towards recovery. Of the endangered species, the wood stork, snail kite, Cape Sable seaside sparrow, and American crocodile, among others, will benefit and increase. Undoubtedly, implementation of the recommended Comprehensive Plan will once again allow us to witness what is now only a fading memory of the former abundance of wildlife in the Everglades.

It is important to understand that the “restored” Everglades of the future will be different from any version of the Everglades that has existed in the past. While it certainly will be vastly superior to the current ecosystem, it will not completely match the pre-drainage system. This is not possible, in light of the irreversible physical changes that have made to the ecosystem. It will be an Everglades that is smaller and somewhat differently arranged than the historic ecosystem. But it will be a successfully restored Everglades, because it will have recovered those hydrological and biological patterns which defined the original Everglades, and which made it unique among the world’s wetland systems. It will become a place that kindles the wildness and richness of the former Everglades.

Lake Okeechobee will once again become a healthy lake. The littoral and pelagic zones within the lake, essential to the lake’s commercial and recreational fishery and other aquatic species, will be greatly enhanced by the water levels projected in the recommended Comprehensive Plan. Water quality will also be improved significantly. The lake provides huge regional benefits to wildlife, including waterfowl, other birds, and mammals.

The Comprehensive Plan provides major benefits to the Caloosahatchee and St. Lucie estuaries, and Lake Worth Lagoon. The plan eliminates almost all the damaging fresh water releases to the Caloosahatchee and most detrimental releases to the St. Lucie. The plan makes substantial improvements to Lake Worth Lagoon. As a result, grassbeds and other submerged aquatic vegetation will benefit and thus provide abundant favorable habitat for the many aquatic species that depend on these areas for food, shelter, and breeding grounds, thereby enhancing the productivity and economic viability of estuarine fisheries. The recommended Comprehensive Plan also includes several water storage and treatment areas to improve water quality conditions in the Indian River Lagoon and the St. Lucie and Caloosahatchee estuarine systems.

The recommended Comprehensive Plan makes improvements in fresh water deliveries to Florida and Biscayne bays. These bays will benefit from more natural water deliveries. Appropriate fresh water regimes will result in substantial improvements in aquatic and semi-aquatic habitats; fish and wildlife will respond

favorably to these beneficial changes. Mangroves, coastal marshes, and seagrass beds interacting together to produce food, shelter, and breeding and nursery grounds will support more balanced, productive fish, shellfish, and wildlife communities.

South Florida does not have to follow the fate of some states that suffer severe water shortages, creating tension between natural resource protection and water supply. The recommended Comprehensive Plan expands the storage capability of the C&SF Project, enabling the system to better meet ecosystem and urban water supply needs in the future. Frequency of water restrictions expected with the recommended Comprehensive Plan are greatly reduced compared to the Without Plan Condition. This will be accomplished by more effectively providing adequate flows from the regional system to recharge the surficial aquifer. This will help offset withdrawals from public water supply wellfields and other users in the urbanized Lower East Coast Region. Such recharge also protects the surficial aquifer from saltwater intrusion, allowing it to remain a productive source of fresh water in the future.

The recommended Comprehensive Plan will significantly increase the capability to supply water from the regional system to agricultural users. This will provide better protection from economically harmful water supply cutbacks and allow agriculture to remain productive. Storage facilities associated with Lake Okeechobee such as those north of the lake, and Lake Okeechobee aquifer storage and recovery will enable the lake to remain an important source of water supply while keeping lake stages at more ecologically desirable levels. Additional storage facilities built throughout the system will diversify sources of water for many users and enable recycling of water within a basin to meet dry season demands, significantly improving the reliability of agricultural water supply in the future.

The recommended Comprehensive Plan also assures that the quality of south Florida's water bodies will be restored to achieve overall ecosystem restoration. The recommended Comprehensive Plan includes many features to assure that water quality standards will be met and water quality conditions are improved or not degraded. The Comprehensive Plan includes the development of a comprehensive integrated water quality plan, which will lead to recommendations for water quality remediation programs and the integration of water quality restoration targets into future design, construction, and operation activities as features of the recommended Comprehensive Plan are implemented.

How the Comprehensive Plan Will Be Implemented

No plan can anticipate fully the uncertainties that are inherent in predicting how a complex ecosystem will respond during restoration efforts. For example, the remaining Everglades are only one-half as large as the original and current

boundaries do not logically follow natural ground elevations or habitat patterns. For these and many other reasons, the ways in which this ecosystem will respond to the recovery of more natural water patterns almost certainly will include some surprises. The recommended Comprehensive Plan anticipates such surprises and is designed to facilitate project modifications that take advantage of what is learned from system responses, both expected and unexpected, and from future restoration targets as those become more refined. For example, future water quality restoration targets will be integrated into the detailed design, construction, and future operation of all recommended Comprehensive Plan features.

A new type of reporting document will be prepared as the implementation process begins. Project Implementation Reports will bridge the gap between the Comprehensive Plan and the detailed design necessary to proceed to construction. In addition to supplemental National Environmental Policy Act documentation, the Project Implementation Report process will allow for continuing public participation on each feature. In this more detailed phase of analysis, Comprehensive Plan components will be further investigated and appropriate actions recommended.

The Comprehensive Plan includes an aggressive adaptive assessment strategy. This strategy ensures that new information about the natural system, learned from continuing research and from measuring responses to implementation of plan components, can be used to increase the ultimate level of success of the overall restoration program. Specifically, adaptive assessment uses a well focused, regional monitoring program to measure how well each component of the plan accomplishes its objectives. This, in turn, sets up opportunities for refinement of succeeding components. Such adaptive assessment and regional monitoring are essential features of the recommended Comprehensive Plan and ensure its overall success. Independent scientific peer review is an integral part of this process.

Pilot projects to demonstrate the effectiveness of technologies such as aquifer storage and recovery, seepage management, and wastewater reuse are a part of the implementation strategy. Three new feasibility studies, Florida Bay and the Florida Keys, Southwest Florida, and a comprehensive integrated water quality plan, will also be undertaken to assure that full implementation of the Comprehensive Plan leads to overall ecosystem restoration in south Florida. The use of the best available science and extensive outreach and public involvement, both of which have been an essential part of the Restudy, will continue during the implementation process.

The recommended Comprehensive Plan described in this report will serve as a framework and guide for modifications to the Central and Southern Florida Project. The pilot projects and a set of specific key components are recommended for initial authorization. The estimated total cost of these initial features are \$1,198,000,000 (October 1999 price levels) and an annual cost of \$20,000,000 for operation and maintenance. The estimated Federal cost is \$599,000,000 with

estimated annual operation and maintenance costs of \$10,000,000; and the estimated non-Federal cost is \$599,000,000 with estimated annual operation and maintenance costs of \$10,000,000.

Further, the Water Resources Development Act of 1996 provided authorization for Critical Restoration Projects in order to expedite implementation of the restoration effort. A similar programmatic authority is recommended to help expedite implementation of some components in the recommended Comprehensive Plan. This programmatic authority would be limited to those components of the Comprehensive Plan that have a total project cost of \$70,000,000 with a maximum Federal cost of \$35,000,000.

Authorization for the remaining components of the Comprehensive Plan will be sought after completion of more detailed planning and submission of Project Implementation Reports to Congress. Each Project Implementation Report will also contain an analysis of the Comprehensive Plan and any recommendations concerning modifications to the plan.

AREAS OF CONTROVERSY AND UNRESOLVED ISSUES

During the course of the Restudy, a number of important issues have emerged. Many have been resolved, but some remain. For example:

Scientific Models. Many scientific and engineering models were used in developing the recommended Comprehensive Plan. The models employed in the Restudy are state-of-the-art, and represent the best understanding of the hydrology of both the pre-drainage and current C&SF system (Natural System Model and South Florida Water Management Model) as well as species responses to hydrology (Across Trophic Landscape System Simulation). But by their very nature, models are uncertain because they are simplifications of reality. The South Florida Water Management Model and the Natural System Model have undergone technical peer review. The conclusions that can be drawn from them are only as good as the basic understandings and information that are the foundations of the models. Most importantly, such conclusions must be understood in the context of model uncertainty and appropriateness of scale, and are best utilized to compare performance among alternative plans. The Natural System Model, for example, depicts the hydrologic response of the pre-drained system to rainfall and other hydrologic conditions of the period from 1965 through 1995. It does not depict the conditions of the pre-drained Everglades system, although there is a misconception that it does; such data does not exist. This model was used to help define performance measures for the natural system and to evaluate the performance of different alternative plans. However, defining acceptable performance of any

particular alternative plan by rigid adherence to outputs from the Natural System Model is an improper use of such output.

Water Quality Restoration Targets. Many water bodies in south Florida are not currently meeting water quality standards. The State of Florida and the Miccosukee and Seminole Tribes are required under the Federal Clean Water Act to identify those water bodies periodically. Total maximum daily loads for those pollutants causing those water bodies to not meet standards and remediation programs to assure that standards will be met must be developed. The current schedule for developing these standards has the potential to delay implementation of certain features of the recommended Comprehensive Plan until those targets are developed and remediation programs are implemented. In addition to this program, several water bodies have been prioritized by the state's Surface Water Improvement and Management Program, including the development of pollutant load reduction goals. There is some concern as to the degree to which remediation programs have been limited, and that some load reduction goals may not be protective enough to achieve ecosystem restoration. The comprehensive integrated water quality plan feasibility study included in the recommended Comprehensive Plan will include prioritizing the development of both water quality standards and pollution load reduction goals consistent with the Restudy implementation schedule. Recommendations will be made for optimizing the design, construction, and operation of plan features to assure that water quality restoration targets are achieved. Existing water quality criteria will be reviewed, and additional water quality criteria may be developed to complement future detailed planning and design activities undertaken to implement recommended Comprehensive Plan components.

Technology Uncertainties. Most of the recommended Comprehensive Plan's features are tested and proven reliable means to manage water. However some of the facilities proposed such as aquifer storage and recovery and seepage control have not been implemented on such a large scale. A series of pilot projects are proposed in the recommended Comprehensive Plan to address the uncertainties of these technologies. Results from these studies will help direct future detailed planning and design related to implementation of these types of facilities.

This Comprehensive Plan makes no claim that all the questions have been answered, that all the uncertainties have been addressed, or that all the issues have been resolved. No plan could do all these things. We have improved our understanding of this complex system and know that there is much more to learn. The Comprehensive Plan is a roadmap -- and a very important one -- that provides critical direction and organizational structure for restoring and protecting the south Florida ecosystem. The Implementation Plan contained in this Comprehensive Plan recommends a phased approach to project construction that provides for substantial region-wide benefits and a feedback mechanism through adaptive assessment to

ensure that implementation of project features continues to achieve desired objectives. The adaptive assessment and monitoring process, including independent scientific peer review, will serve as a system “check” as projects are constructed and operated. Enough flexibility has been built into the Implementation Plan such that project design and sequencing will take into account system responses and new information as it becomes available.

WHY RESTORE THE EVERGLADES?

Why restore the Everglades? The answers to this question are overwhelming. The Everglades is to south Florida what the Rockies are to many western states; the old growth forests are to the Pacific northwest; the Adirondack, White and Green Mountains are to the northeast; and the Mississippi River is to the nation's heartland. The Everglades epitomizes the region's sense of definition and place, both substantially and spiritually (by providing clean water and recreation and by providing a sense of hope for the quality of the region's future). The Everglades is unlike any other place in the world. It attracts the eyes of the world.

We are now at an important crossroad in our efforts to restore this internationally important ecosystem. If we act now with courage and vision to implement this technically sound comprehensive restoration plan, we will be successful and we will leave a proud Everglades legacy. If we fail to act, our legacy will be one of lost opportunities for all future generations. The world is indeed watching as we make this choice.

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**CENTRAL AND SOUTHERN FLORIDA PROJECT
COMPREHENSIVE REVIEW STUDY**

**FINAL
INTEGRATED FEASIBILITY REPORT
AND
PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT**

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- I - Air Quality (Volume 7)
- J - Existing Condition (Volume 8)
- K - Environmental Effects of the Initial Draft Plan (Volume 9)
- L - Prior Studies, Reports, and Projects (Volume 9)
- M - Implementation Plan Scheduling and Sequencing (Volume 9)
- N - Comment/Response (Volume 10)
- O - Uncertainty (Volume 10)

Note: * Required for NEPA compliance